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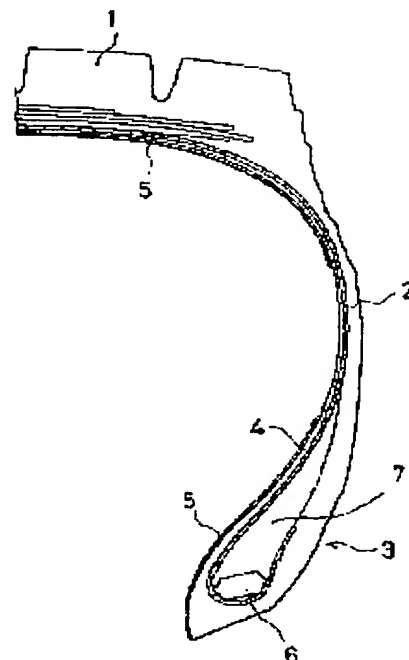
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(54) PNEUMATIC TIRE

(57)Abstract:

PURPOSE: To reduce weight, and also to enhance pneumatic-pressure retainability by using a nylon alloy.

CONSTITUTION: A nylon alloy is used as a constituting material of an inner liner 5 and/or a bead part 3, and is stuck to an extra-high polymer polyethylene sheet that has been formed by a cutting-out method via ethylene--propylene--diene copolymer rubber obtained by treating a nylon alloy with maleic anhydride, and also is stuck to the rubber layer of a tire via the extra-high polymer polyethylene sheet.



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CLAIMS

[Claim(s)]

[Claim 1] The pneumatic tire pasted up on the rubber layer of a tire through this ultra-high-molecular-weight-polyethylene sheet while making the ultra-high-molecular-weight-polyethylene sheet which used the nylon system alloy as a component of an inner liner and/or the bead section, began to shave through the ethylene-propylene-diene system copolymer rubber which processed this nylon system alloy by the maleic anhydride, and was fabricated by the method paste.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the pneumatic tire which improved air retentivity with lightweight-ization by using a nylon system alloy for the component of a tire.

[0002]

[Description of the Prior Art] Low mpg nature is in one of the big technical technical problems in an automobile. As part of the cure which solves this technical technical problem, the demand to lightweight-izing is becoming a still stronger thing also to a pneumatic tire. As one means of lightweight-izing of this pneumatic tire, only by reducing the amount of rubber, although what is necessary is just to have reduced the amount of the rubber used, since a tire performance etc. is made to get worse by rigid fall, there is a limitation.

[0003] Then, although the attempt made to substitute for some rubber by crystalline thermoplastics occurred as a measure for the above problems, since the adhesive property with vulcanized rubber was bad, generally use to a dynamic use like a tire was made difficult.

[0004]

[Problem(s) to be Solved by the Invention] The purpose of this invention is by using a nylon system alloy as thermoplastics to offer the pneumatic tire which improved pneumatic pressure retentivity with lightweight-ization.

[0005]

[Means for Solving the Problem] A nylon system alloy is used for this invention which attains such a purpose as a component of an inner liner and/or the bead section. The ethylene-propylene-diene system copolymer rubber which processed this nylon system alloy by the maleic anhydride While making the ultra-high-molecular-weight-polyethylene sheet (it abbreviates to the amount PE sheet of super-macromolecules below) which minded (it abbreviates to MAH processing EPDM rubber hereafter), began to shave, and was fabricated by the method paste, it is characterized by making the rubber layer of a tire paste through this amount PE sheet of super-macromolecules.

[0006] a nylon system alloy -- rubber ratio **** -- it has high rigidity, while it is lightweight, and it has the property which was moreover excellent in flexibility, gas-proof permeability, etc. being able to paste up this nylon system alloy on the amount PE sheet of super-macromolecules firmly through MAH processing EPDM rubber, and pasting up firmly this amount PE sheet of super-macromolecules to a rubber layer by making an unvulcanized rubber rival and making it vulcanize -- ***** -- it becomes like Therefore, if such a nylon system alloy is used for the inner liner and/or the bead section of a tire, even if it turns lightweight, a rigid fall cannot be caused and, moreover, pneumatic pressure retentivity can be improved by the outstanding gas-proof permeability.

[0007] In this invention, the amount PE sheet of super-macromolecules which began to shave and was fabricated by the method carries out heating pressurization sintering of the polyethylene powder of the amount of super-macromolecules, produces a pillar-like moldings, and means what shaved this moldings on thin meat at the hoop direction, and was started in the shape of a film. Drawing 1 shows one example of the pneumatic tire of this invention. For 1, as for the sidewall section and 3, the tread section and 2 are [the bead section and 4] carcass layers. The carcass layer 4 is turned up so that the both ends may wrap in a bead filler 7 around the bead core 6 of a right-and-left both-sides couple. Except for the part corresponding to the sidewall section 2, inside [maximum] a tire, an inner liner 5 sticks inside, and is made it.

[0008] The inner liner 5 and the bead filler 7 consist of nylon system alloys among the tire structural materials constituted as mentioned above. The amount PE sheet of super-macromolecules pastes up through MAH

processing EPDM rubber, and the [0009] which the main part of these nylon system alloy pastes up to a rubber layer has further structure which this amount PE sheet of super-macromolecules pastes up on a rubber layer. [0009] Although the inner liner 5 may be formed in the whole tire inside, it is desirable to remove some [corresponding to the sidewall section 2 which receives the severest flexion deformity like the example preferably shown in drawing 1] fields. Thus, the obtained tire can be lightweight-ized, maintaining [compared with rubber specific gravity is small, and] required rigidity, since the nylon system alloy with high rigidity is used as a tire component. Moreover, since a nylon system alloy has high gas-proof permeability, it can improve pneumatic pressure retentivity.

[0010] There are some which are obtained from at least two kinds of resin mixture chosen from nylon system resins, such as nylon 6, Nylon 11, Nylon 66, Nylon 46, and those copolymers, as the above-mentioned nylon system alloy. In this nylon system alloy, the polyamide system resins and polyolefine system resins other than the aforementioned nylon system resin can be contained. The nylon system alloy [section / 40 - 80 weight] excellent in the gas-proof permeability which carries out at least one sort of nylon system alloy / which contains polyamide system resins other than aforementioned Nylon 11, such as nylon 6, for Nylon 11 less than 40% of the weight at least 60% of the weight or more /, and nylon 6 and nylon 6-66 copolymer as an example, and carries out 10-40 weight section content of 5 - 30 weight section and the polyolefine system resin for Nylon 11 can be mentioned. As the above-mentioned polyolefine system resin, there are those maleic-acids addition products, such as polyethylene, polypropylene, and an alpha olefin copolymer like EPDM, etc., for example.

[0011] Moreover, it is begun to shave the amount PE sheet of super-macromolecules, and it is fabricated with a method, and while having the adhesive property which was excellent to rubber material, it is flexible and excels in flexibility, and since it is moreover high crystallinity, it has the property which was excellent in many, such as tensile strength, a modulus of elasticity in tension, dimensional stability, gas-proof permeability, and water resistance. As for such an amount PE sheet of super-macromolecules, it is good that molecular weight forms from the polyethylene of at least 1 million desirably. The adhesive property by the heat weld to rubber material improves by being 1 million or more. Moreover, as for the thickness, it is desirable that it is the range of the range of 20-200 micrometers. A firm adhesive property is acquired by setting this thickness to 20 micrometers or more. Moreover, by being referred to as 200 micrometers or less, it is flexible and a part for jointing excellent in flexibility is formed.

[0012] The above-mentioned nylon system alloy has pasted up the amount PE sheet of super-macromolecules through MAH processing EPDM rubber. When this MAH processing EPDM rubber does not intervene, it becomes impossible to paste up with the amount PE sheet of super-macromolecules, and it becomes impossible to paste up a nylon system alloy on a rubber layer through this amount PE sheet of super-macromolecules. Moreover, not only the single-sided front face but a both-sides front face can be made to paste up the amount PE sheet of super-macromolecules on a nylon system alloy through MAH processing EPDM rubber.

[0013] The layered product of such a nylon system alloy and an amount PE sheet of super-macromolecules is producible as follows. That is, a nylon system alloy is fabricated to the component of a predetermined configuration, and it is obtained by piling up and carrying out heating adhesion of both the front faces in which this MAH processing EPDM rubber adhered to the front face, respectively after [this and the amount PE sheet of super-macromolecules] carrying out application dryness of the MAH processing EPDM rubber solution. It is good to use what was dissolved so that the concentration might become the range which is 0.5 - 40 % of the weight at organic solvents, such as a normal hexane, toluene, and a xylene, as the above-mentioned MAH processing EPDM rubber solution, for example. Moreover, beyond the melting point of a nylon system alloy, the temperature at the time of piling up and heating the adhesion sides of this MAH processing EPDM rubber is 200 degrees C or more, and it is preferably good to make it preferably the range of 300 degrees C or less below the temperature to which the amount PE sheet of super-macromolecules heat-deteriorates.

[0014] Moreover, the pneumatic tire which used this nylon system alloy can laminate the component which becomes the amount PE sheet side of super-macromolecules of a nylon system alloy from a non-vulcanized rubber constituent, can produce a predetermined green tire, and can manufacture it by carrying out vulcanization fabrication using metal mold according to a conventional method. In this case, it is, even if it is any, although it consists of the thing or vulcanized rubber which consists of an unvulcanized-rubber constituent, and the component laminated in the amount PE sheet side of super-macromolecules of a nylon system alloy is **. However, when a component consists of a non-vulcanized rubber constituent, it is critical-surface-tension γ_{mac} . It is desirable to constitute from a rubber constituent containing 25-35mm N [/meter] (for it to abbreviate to mN/m below) raw material rubber. This critical-surface-tension γ_{mac} . By using the rubber constituent containing the raw material rubber of the above-mentioned range, the component which improved

the adhesive property over the amount PE sheet of super-macromolecules can be obtained.

[0015] It sets to this invention and is above-mentioned critical surface tension γ_{mac} . If surface tension of θ and its liquid is set to γ for the contact angle which the homologous series of the organic liquid compound of liquid hydrocarbon and others show on a solid-state side as indicate by the Maruzen Co., Ltd. issue, "chemistry handbook" basic volume II and the 618th page on August 20 (the 3rd **), Showa 53, the relation between $\cos \theta$ and γ will not be relate with the kind of homolog, but will become one straight line generally. γ_{mac} which is equivalent to $\theta = 0$, $\cos \theta = 1$ [i.e.,], at this time It is defined as saying a value. Critical-surface-tension γ_{mac} of the raw material rubber defined as this invention The value similarly measured using the rubber sample which carried out hot press of the raw material rubber, and made it flat instead of the above-mentioned solid-state is said.

[0016] Critical-surface-tension γ_{mac} of the above-mentioned range As raw material rubber which it has U.S. MASERU Decker () [Marcel] Dekker, Inc., and New York "Handbook OBU ERASUTO Mars NYUDEBEROPPUENTO- and - technology" () of and Basel1988 issue [Handbook of Elastomers New Development] and Technology : EKE, baud MIKKU and ETCHIERU, SUTEFANZU (A, K, Bhowmik and H, L, Stephens) work, The isobutylene-isoprene copolymer rubber indicated in Table 1 of 253 page of octavus **** (IIR, $\gamma_{\text{mac}} = 27$ mN/m), Ethylene-propylene diene ternary polymerization object rubber (EPDM, $\gamma_{\text{mac}} = 28$ mN/m), There are natural rubber (NR, $\gamma_{\text{mac}} = 31$ mN/m), a polybutadiene rubber (BR, $\gamma_{\text{mac}} = 32$ mN/m), styrene-butadiene copolymer rubber (SBR, $\gamma_{\text{mac}} = 33$ mN/m), etc.

[0017] Moreover, it is critical-surface-tension γ_{mac} mentioned above according to bridge formation of raw material rubber when a component consisted of vulcanized rubber. It increases and is critical-surface-tension γ_{mac} with the amount PE sheet of super-macromolecules ($\gamma_{\text{mac}} = 29$ mN/m). A difference becomes large too much and the adhesive property over the amount PE sheet of super-macromolecules of a component falls. For this reason, when a component consists of vulcanized rubber, it is desirable to make another amount PE sheet of super-macromolecules rival on the front face of the component which consists of a rubber constituent which is not vulcanized before vulcanization, to be more than the vulcanization start temperature of the rubber constituent which is not vulcanized [aforementioned], and to heat in temperature of 130 degrees C - 300 degrees C preferably beyond the melting point (125 degrees C) of the amount PE sheet of super-macromolecules, and to carry out heat adhesion simultaneously with vulcanization. It can paste up firmly by making it laminate with the amount PE sheet side of super-macromolecules of the component which consists of this vulcanized rubber, and the amount PE sheet side of super-macromolecules of the nylon system alloy of this invention, and carrying out heat adhesion. Moreover, it is critical-surface-tension γ_{mac} like the component which consists of a non-vulcanized rubber constituent. The rubber constituent containing the raw material rubber of 25 - 35 mN/m can be used.

[0018]

[Example] Two kinds of following this invention tires and a following comparison tire were manufactured. Each tire size of these tires was set to same 165SRs13.

This-invention tire: The green tire constituted from a nylon alloy which consists nylon 6 in the inner liner 5 and bead filler 7 except the part of the maximum inside corresponding to the sidewall section 2 of the tire shown in drawing 1, and consists 15 weight sections and EPDM of the 15 weight sections in 70 weight sections and Nylon 11 was manufactured, and vulcanization fabrication was carried out according to the conventional method using metal mold.

[0019] An inner liner 5 fabricates the above-mentioned nylon alloy on the sheet whose thickness is 400 micrometers. On a front face with the sheet with a thickness of 50 micrometers with which the front face and average molecular weight which began to delete and was fabricated with the method consist of polyethylene of 5,500,000 The 1.0-% of the weight normal-hexane solution of the MAH processing EPDM rubber (TAFUMA MP-0610) by the Mitsui petrochemical company is applied. After drying for 60 minutes at 20 degrees C, the MAH processing EPDM rubber adhesion sides of both [these] sheets are piled up, and they are 20 kg/cm². What heated for 20 minutes and carried out heat adhesion at 150 degrees C was used under pressurization.

Comparison tire: Non-vulcanized isobutylene isoprene rubber with a thickness of about 500 micrometers was prepared all over the maximum inside of a tire through tie rubber with a thickness of about 700 micrometers as an inner liner 5, except having used the usual natural rubber compound as a bead filler 7, the green tire of the same composition as this invention tire was manufactured, and vulcanization fabrication was carried out.

[0020] when the weight of an inner liner and a bead filler is computed and measured about these two kinds of this invention tires, and a comparison tire, respectively, compared with a comparison tire, a weight is small and this invention tire of a tire is [about 50%] lightweight -- it had turned Moreover, the air leak test was performed

by the following method about this invention tire and the comparison tire.

Air leak test: Internal pressure 2.0 kgf/cm² after equipping an indicator rim with a tire (quiescent state) at the room temperature of 21 degrees C It is left for 48 hours and is internal pressure 2.0 kgf/cm² It readjusts. Internal pressure is measured over three months for 48 hours for every progress as an origin of the time of a measurement start of immediately after readjustment.

[0021] It is $y = \beta t^2$ with the least square method about measurement data. It recurs, considers as $t = \text{time}(\text{Sun.})$ and $y = \text{internal pressure (measurement internal pressure / 2.0)}$, and asks for the air leak coefficient β . $t = 30$ days are substituted and the internal pressure decreasing rate per month (Z) is computed according to a lower formula.

To $Z(\%/month) = (1 - e^{-\beta \cdot 30}) \times 100$, consequently internal pressure (decreasing rate Z) = 2.6% of the comparison tire, it is internal pressure (decreasing rate Z) = 2.0% of this invention tire, and excelled in pneumatic pressure retentivity.

[0022]

[Effect of the Invention] Lightweight-ization can be enabled maintaining required rigidity, since according to this invention it excelled in gas-proof permeability and low specific gravity and the ** nylon system alloy of high rigidity were applied to an inner liner and/or the bead section, and, moreover, pneumatic pressure retentivity can be improved. Moreover, since the amount PE sheet of super-macromolecules is pasted up for the bonded structure of a nylon system alloy and a rubber layer on this nylon system alloy through MAH processing EPDM rubber and this amount PE sheet of super-macromolecules was pasted up on the rubber layer, it becomes possible to paste up a nylon system alloy on the rubber layer of a tire firmly, and it can lightweight-ize a pneumatic tire.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the half-section view showing one example of the pneumatic tire of this invention.

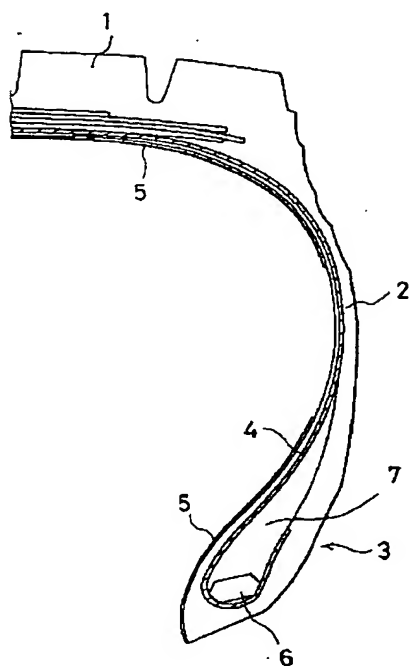
[Description of Notations]

3 Bead Section 5 Inner Liner

7 Bead Filler

[Translation done.]

Drawing selection drawing 1



[Translation done.]

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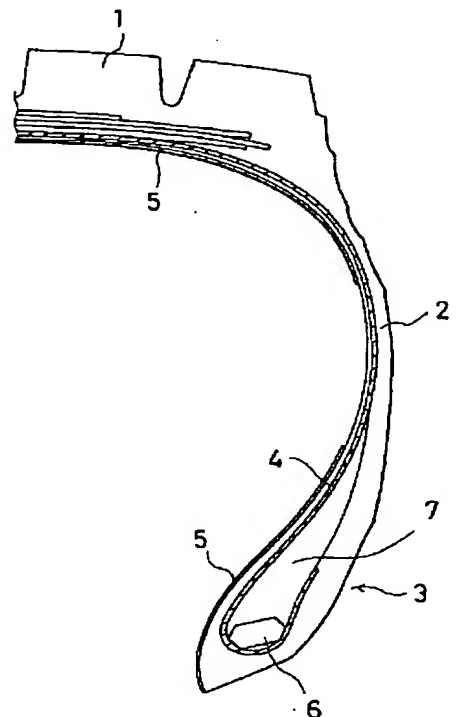
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(54)【発明の名称】 空気入りタイヤ

(57)【要約】

【目的】 ナイロン系アロイを使用することにより、軽量化と共に空気圧保持性を向上する。

【請求項1】 ナイロン系アロイをインナーライナー5及び又はビード部3の構成材料として使用し、該ナイロン系アロイを無水マレイン酸で処理したエチレン-プロピレン-ジエン系共重合体ゴムを介して削り出し方式で成形した超高分子量ポリエチレンシートに接着させると共に、該超高分子量ポリエチレンシートを介してタイヤのゴム層に接着させる。



【特許請求の範囲】

【請求項1】 ナイロン系アロイをインナーライナー及び／又はビード部の構成材料として使用し、該ナイロン系アロイを無水マレイン酸で処理したエチレン-プロピレンジエン系共重合体ゴムを介して削り出し方式で成形した超高分子量ポリエチレンシートに接着させると共に、該超高分子量ポリエチレンシートを介してタイヤのゴム層に接着させた空気入りタイヤ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、ナイロン系アロイをタイヤの構成材料に使用することにより軽量化と共に空気保持性を向上した空気入りタイヤに関するものである。

【0002】

【従来の技術】 自動車における大きな技術的課題の一つに低燃費性がある。この技術課題を解決する対策の一環として、空気入りタイヤに対しても軽量化に対する要求がますます強いものになってきている。この空気入りタイヤの軽量化の1つの手段としては、ゴムの使用量を減らせばよいが、単にゴム量を減らしただけでは剛性の低下によってタイヤ性能等を悪化させることになるので限界がある。

【0003】 そこで、上述のような問題の対策として、ゴムの一部を結晶性の熱可塑性樹脂によって代替させる試みがあるが、一般に加硫ゴムとの接着性が悪いため、タイヤのような動的用途への使用は困難とされていた。

【0004】

【発明が解決しようとする課題】 本発明の目的は、熱可塑性樹脂としてナイロン系アロイを使用することにより、軽量化と共に空気圧保持性を向上した空気入りタイヤを提供することにある。

【0005】

【課題を解決するための手段】 このような目的を達成する本発明は、ナイロン系アロイをインナーライナー及び／又はビード部の構成材料として使用し、該ナイロン系アロイを無水マレイン酸で処理したエチレン-プロピレンジエン系共重合体ゴム（以下、MAH処理EPDMゴムと略す）を介して削り出し方式で成形した超高分子量ポリエチレンシート（以下超高分子量PEシートと略す）に接着させると共に、この超高分子量PEシートを介してタイヤのゴム層に接着させたことを特徴とする。

【0006】 ナイロン系アロイは、ゴム比べて軽量であると共に高い剛性を有しており、しかも耐屈曲性、耐ガス透過性等に優れた特性を有している。このナイロン系アロイは、MAH処理EPDMゴムを介して超高分子量PEシートに強固に接着させることができ、また、この超高分子量PEシートは未加硫ゴムに張り合わせて加硫させることによりゴム層に対し強固に接着させることができるようになる。したがって、このようなナイロン系アロイをタイヤのインナーライナー及び／又はビード部

に使用すれば、軽量化しても剛性の低下を招くことはなく、しかもその優れた耐ガス透過性により空気圧保持性を向上することができる。

【0007】 本発明において、削り出し方式で成形した超高分子量PEシートとは、超高分子量のポリエチレン粉末を加熱加圧シンタリングして円柱状の成形物を作製し、この成形物をその周方向に薄肉に削ってフィルム状に切り出したものをいう。図1は、本発明の空気入りタイヤの1例を示す。1はトレッド部、2はサイドウォール部、3はビード部、4はカーカス層である。カーカス層4は、左右両側一対のビードコア6の廻りに、その両端部がビードフィラー7を包み込むように折り返されている。タイヤの最内側にはインナーライナー5がサイドウォール部2に対応する一部を除いて内貼りされている。

【0008】 上述のように構成されたタイヤ構成材料のうち、インナーライナー5とビードフィラー7とはナイロン系アロイから構成されている。これらナイロン系アロイの本体がゴム層に対して接着する領域は、MAH処理EPDMゴムを介して超高分子量PEシートが接着され、さらにこの超高分子量PEシートがゴム層に接着する構造になっている。

【0009】 インナーライナー5は、タイヤ内面の全体に設けられていてもよいが、好ましくは図1に示す実施例のように最も厳しい屈曲変形を受けるサイドウォール部2に対応する一部の領域を除くようにすることが望ましい。このようにして得られたタイヤは、ゴムに比べて比重が小さく、剛性が高いナイロン系アロイがタイヤ構成材料として使用されているので、必要な剛性を維持しながら軽量化することができる。また、ナイロン系アロイは、高い耐ガス透過性を有するため空気圧保持性を向上することができる。

【0010】 上記ナイロン系アロイとしては、ナイロン6、ナイロン11、ナイロン66、ナイロン46及びそれらの共重合体等のナイロン系樹脂から選ばれた少なくとも2種類の樹脂混合物から得られるものがある。このナイロン系アロイには、前記ナイロン系樹脂以外のポリアミド系樹脂並びにポリオレフィン系樹脂を含有することができる。具体例としては、ナイロン11を少なくとも60重量%以上、ナイロン6等の前記ナイロン11以外のポリアミド系樹脂を40重量%未満含有するナイロン系アロイや、ナイロン6及びナイロン6-66共重合体の少なくとも1種を40~80重量部、ナイロン11を5~30重量部、ポリオレフィン系樹脂を10~40重量部含有する耐ガス透過性に優れたナイロン系アロイを挙げることができる。上記ポリオレフィン系樹脂としては、例えばポリエチレン、ポリプロピレン、EPDMのような α -オレフィン共重合体等並びにそれらのマレイン酸付加物等がある。

【0011】 また、超高分子量PEシートは、削り出し

方式により成形したものであり、ゴム材料に対して優れた接着性を有すると共に、柔軟で耐屈曲性に優れており、しかも高結晶性であるため引張強度、引張弾性率、寸法安定性、耐ガス透過性、耐水性等の多くの優れた性質を有する。このような超高分子量PEシートは、望ましくは分子量が少なくとも100万のポリエチレンから形成するのがよい。100万以上であることによりゴム材料に対する熱融着による接着性が向上する。また、その厚さは、20~200 μ mの範囲の範囲であることが望ましい。この厚さを20 μ m以上とすることにより強固な接着性が得られる。また、200 μ m以下とすることにより柔軟で可撓性に優れた接着部分を形成するようにする。

【0012】上記ナイロン系アロイは、MAH処理EPDMゴムを介して超高分子量PEシートを接着している。このMAH処理EPDMゴムが介在しないときは、ナイロン系アロイは超高分子量PEシートと接着することができなくなり、この超高分子量PEシートを介してゴム層に接着させることができなくなる。また、ナイロン系アロイには、その片側表面だけでなく両側表面にMAH処理EPDMゴムを介して超高分子量PEシートを接着させることができる。

【0013】このようなナイロン系アロイと超高分子量PEシートとの積層体は、次のようにして作製することができる。即ち、ナイロン系アロイを所定の形状の構成材料に成形し、これと超高分子量PEシートとのそれぞれ表面に、MAH処理EPDMゴム溶液を塗布乾燥した後、このMAH処理EPDMゴムが付着した両表面同士を重ね合わせて加熱接着することにより得られる。上記MAH処理EPDMゴム溶液としては、例えばノルマルヘキサン、トルエン、キシレン等の有機溶剤に、その濃度が0.5~40重量%の範囲になるように溶解したものを使用するのがよい。また、このMAH処理EPDMゴムの付着面同士を重ね合わせて加熱する際の温度は、ナイロン系アロイの融点以上、好ましくは200℃以上で、超高分子量PEシートが熱劣化する温度以下、好ましくは300℃以下の範囲にするのがよい。

【0014】また、このナイロン系アロイを使用した空気入りタイヤは、ナイロン系アロイの超高分子量PEシート面に未加硫のゴム組成物からなる構成材料をラミネートして所定のグリーンタイヤを作製し、常法に従い、金型を用いて加硫成形することにより製造することができる。この場合、ナイロン系アロイの超高分子量PEシート面にラミネートする構成材料は、未加硫ゴム組成物からなるもの又は加硫ゴムからなるもののいずれであってもよい。しかし、構成材料が未加硫のゴム組成物からなる場合は、臨界面張力 γ_c が25~35ミリニュートン/メートル（以下mN/mと略す）の原料ゴムを含有するゴム組成物から構成することが望ましい。この臨界面張力 γ_c が上記範囲の原料ゴムを含有するゴム組成

物を使用することにより、超高分子量PEシートに対する接着性を向上した構成材料を得ることができる。

【0015】本発明において、上記臨界面張力 γ_c とは、昭和53年8月20日（第3刷）丸善株式会社発行「化学便覧」基礎編II、第618頁に記載されているように、固体面上で液体炭化水素その他の有機液体化合物の同族列が示す接触角を θ 、その液体の表面張力を γ とすると、 $\cos \theta$ と γ との関係は同族体の種類に関せず大体一本の直線となる。このとき、 $\theta=0$ 、すなわち $\cos \theta=1$ に相当する γ_c の値をいうと定義されている。本発明に定義する原料ゴムの臨界面張力 γ_c は、上記固体の代わりに、原料ゴムを加熱プレスして平坦にしたゴムサンプルを使用して同様に測定した値をいう。

【0016】上記範囲の臨界面張力 γ_c を有する原料ゴムとしては、米国マーセル・デッカー社（Marcel Dekker, Inc., New York and Basel）1988年発行の“ハンドブック・オブ・エラストマーズ ニューデベロップメント・アンド・テクノロジー”（Handbook of Elastomers New Development and Technology）：エーケー、ボーミック及びエッチェル、ステファンズ（A, K, Bhowmik and H, L, Stephens）著、第8章第253頁の表1に記載されている、イソブチレン-イソプレン共重合体ゴム（IIR, $\gamma_c=27$ mN/m）、エチレン-プロピレンジエン三元共重合体ゴム（EPDM, $\gamma_c=28$ mN/m）、天然ゴム（NR, $\gamma_c=31$ mN/m）、ポリブタジエンゴム（BR, $\gamma_c=32$ mN/m）、スチレン-ブタジエン共重合体ゴム（SBR, $\gamma_c=33$ mN/m）等がある。

【0017】また、構成材料が加硫ゴムからなる場合は、原料ゴムの架橋により前述した臨界面張力 γ_c が増大し、超高分子量PEシート（ $\gamma_c=29$ mN/m）との臨界面張力 γ_c の差が大きくなり過ぎて、構成材料の超高分子量PEシートに対する接着性が低下する。このため、構成材料が加硫ゴムからなる場合は、加硫前の未加硫のゴム組成物からなる構成材料の表面に、別の超高分子量PEシートを張り合わせて、前記未加硫のゴム組成物の加硫開始温度以上で、かつ超高分子量PEシートの融点（125℃）以上、好ましくは130℃~300℃の温度に加熱し、加硫と同時に熱接着することが望ましい。この加硫ゴムからなる構成材料の超高分子量PEシート面と、本発明のナイロン系アロイの超高分子量PEシート面とラミネートさせて熱接着することにより強固に接着することができる。また、未加硫のゴム組成物からなる構成材料と同様に、臨界面張力 γ_c が25~35mN/mの原料ゴムを含有するゴム組成物を使用することができる。

【0018】

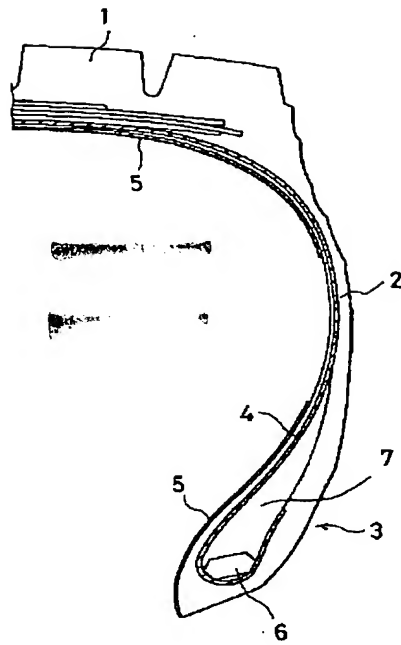
【実施例】次の2種類の本発明タイヤ及び比較タイヤを製作した。これらのタイヤのタイヤサイズはいずれも同一の165SR13とした。

空気漏れ試験：室温 21℃で、タイヤ（静止状態）を標識リムに装着した後、内圧 2.0 kgf/cm² で 48

$$Z (\% / \text{月}) = (1 - e^{-\beta \cdot 30}) \times 100$$

3 ビード部 5 インナーライナー
7 ビードフィラー

【図1】



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